

# Wheat Harvesting Techniques

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## ABSTRACT

India is 2<sup>nd</sup> largest wheat producer in the world after China. Productivity of wheat vary from 1310 Mt/ Hect in Maharashtra to 4510 Mt/ Hect. In Punjab. Top three wheat producing states are Uttar Pradesh with 33.80% area and 33.66% production; Punjab with 12.66% area and 21.22% production and Haryana with 8.56% area and 12.88% production.

Wheat harvesting methods prevalent in India are Traditional manual Cutting, by reaper, by Reaper Binder, by Combine machine and by Brush cutter.

Each method has its own advantage and disadvantages. In traditional method wastage is lowest while it is very time consuming, costly and non availability of labour has forced development of different methods. Harvesting by reaper will save time and straw but not much successfully as harvested wheat does not fall in line due to wind flow. Harvesting by reaper binder will also save time and straw but costly. Harvesting by combine is fastest, time saving but it is costly and farmers burns the fields with wheat stems, combine machines are very costly. New method of wheat harvesting by brush cutter is cheapest, good for small farmers and labours who are cutting wheat by traditional method, lower cost of machines but it is also time consuming. See the advantage and disadvantage of different technique one has to select the model which suits him best.

## Introduction

**India is 2<sup>nd</sup> largest wheat producer in the world after China.**

India stands 2nd in production next to China in the world. The India's share in world Wheat area is about 12.5%, whereas it occupies 12 % share in the total world Wheat production

In terms of area, the state of Uttar Pradesh stands first followed by Madhya Pradesh, Punjab, Rajasthan, Haryana, Bihar, Maharashtra, Gujarat, Uttarnchal, West Bengal, Himachal Pradesh, Karnataka and Jammu & Kashmir. In terms of production, U.P. again occupies first place followed by Punjab, Haryana, Madhya Pradesh, Rajasthan, Bihar, Maharashtra, Gujarat, West Bengal, Uttarnchal, Himachal Pradesh, Jammu & Kashmir and Karnataka. The contribution of these states in the production is about 99.5% (Fig.-1). The contribution of other States is minimal. As regards to the productivity, Punjab stands first (4531 Kg/ha.) followed by Haryana (4066 Kg/ha.), Uttar Pradesh (2691 Kg./ha.), Rajasthan (2481 Kg/ha.), West Bengal (2321 Kg/ha.), Gujarat (2294 Kg/ha.), Bihar (2143 Kg/ha.), Uttarnchal(1873 Kg/ha.).

## Top Ten Wheat Producers -2008

(million Metric ton)

China	112
India	79
United State	68
Russia	64
France	39
Canada	29
Germany	26
Ukraine	2
Australia	21
Pakistan	21
<b>World Total</b>	<b>690</b>

Source : UN Food & Agriculture Organisation (FAO)

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Last Ten year Wheat Production in India (million Metric ton)		Top Ten Wheat Producing State, Area in %		
State	% Area	% Production		
Uttar Pradesh	33.80	33.66	2010	80.7
Punjab	12.66	21.22	2009	80.7
Haryana	8.56	12.88	2008	78.6
Madhya Pradesh	14.77	9.58	2007	75.8
Rajasthan	9.65	8.86	2006	69.3
Bihar	7.79	6.18	2005	68.6
Maharashtra	3.53	1.71	2004	72.1
Gujrat	1.84	1.56	2003	65.1
West Bengal	1.45	1.24	2002	71.8
Uttranchal	1.50	1.04	2001	69.7
Source : United Nation Department of Agriculture		Note: Above figures are average of 1998-2001.		
		Sources: Dte. of E & S, Govt. of India, Krishi Bhawan, New Delhi		

Top Ten Wheat Producing State, Area and Productivity			
State	Area (Million Ha.)	Production (Million MT)	Productivity (Kg/ha.)
Uttar Pradesh	9.023	24.284	2691
Punjab	3.378	15.307	4531
Haryana	2.285	9.290	4066
Madhya Pradesh	3.944	6.913	1753
Rajasthan	2.575	6.389	2481
Bihar	2.080	4.457	2143
Maharashtra	0.940	1.231	1310
Gujrat	0.490	1.124	2294
West Bengal	0.386	0.896	2321
Urranchal	0.399	0.748	1873
All India	6.692	72.140	2703
Note: Above figures are average of 1998-2001.			
Sources: Dte. Of E & S, Govt. of India, Krishi Bhawan, New Delhi			

#### Plan-wise Area, Production and Productivity of Wheat in India

The area, production and productivity of Wheat in respect of different Five Year/ Annual Plans are given in the table on next page :-

There has been consistent increase in the area, production and productivity of Wheat from I Plan to IX Plan (Fig. 2-4). The percent increase in area, production and productivity has been in order of 204.76, 621.85 and 301.46, respectively. The area under Wheat has been more than doubled, whereas the production has gone six times and the productivity increase has been three times since first Plan. Though since I Plan, there has been increase in area, production and productivity, but when year-wise data of IX Plan is analyzed, it would be observed that the area under Wheat is almost stagnant and production and productivity are also fluctuating. It is mainly because of most of the Wheat area is followed after Rice. In this crop rotation, a number of difficulties are being faced and efforts are being made to persuade the farmers to go for diversified crops in place of Rice & Wheat, so that fertility level of soils are maintained.

We can clearly see from the table that Hardoi leads in surplus wheat straw with 3.12 lakh MT followed by Gorakhpur with 2.56 lakh MT with Maharajganj on the third with 2.29 lakh

Plan Period	Area in lakh ha.	Production in lakh Tonnes	Productivity in Kgs./ha.
<b>First Plan (1951-56)</b>	107.22	79.00	737
<b>Second Plan (1956-61)</b>	128.36	97.34	758
<b>Third Plan (1961-66)</b>	133.30	110.72	831
<b>Annual Plans (1966-69)</b>	145.96	155.26	1064
<b>Forth Plan (1969-74)</b>	184.10	233.70	1069
<b>Fifth Plan (1974-79)</b>	206.96	298.42	1442
<b>Annual Plan (1979-80)</b>	221.70	318.30	1436
<b>Sixth Plan (1980-85)</b>	232.44	412.20	1773
<b>Seventh Plan (1985-90)</b>	233.60	483.80	2071
<b>Annual Plans (1990-92)</b>	237.15	554.15	2338
<b>Eighth Plan (1992-97)</b>	252.68	628.54	2487
<b>Ninth Plan (1997-2002)</b>	264.92	708.48	2674

**Note:-** The figures are taken as average of the different plan periods.

MT. Out of total Wheat Straw Production of 1,41,56,838 MT in the area, 1,23,94,922 MT is consumed by animals which is around 87.55%.

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**Source:** [United States Department of Agriculture](#)

The Main Harvesting Techniques used in India are as follows:

District wise Area, Production, Consumption and Surplus of wheat straw.

Sl	District	AREA (In Ht.)	Production (MT)			CONSUMPTION (MT)				Surplus Wheat Straw
			Crop (MT)	WHEAT	WHEAT STRAW	COW	BUFFALOS	TOTAL ANIMAL	TOTAL CONSP.	
1	MAU	93,569	280,707	280,707	280,707	172,662	154,682	327,344	209,091	71,61
2	AZAMGARH	229,036	687,108	687,108	687,108	496,123	379,364	875,487	559,217	127,89
3	BALIYA	138,523	415,569	415,569	415,569	263,580	186,571	450,151	287,534	128,03
4	LAKHIMPUR KHIRI	192,605	577,815	577,815	577,815	494,903	349,632	844,535	539,447	38,36
5	SITAPUR	202,272	606,816	606,816	606,816	605,194	429,218	1,034,412	660,731	(53,91)
6	HARDOI	309,290	927,870	927,870	927,870	571,519	391,740	963,259	615,282	312,58
7	UNNAO	227,359	682,077	682,077	682,077	406,213	418,463	824,676	526,762	155,31
8	LUCKNOW	84,365	253,095	253,095	253,095	237,760	220,328	458,088	292,604	(39,50)
9	RAIBARELLY	182,636	547,908	547,908	547,908	525,815	312,157	837,972	535,255	12,65
10	FATEHPUR	151,571	454,713	454,713	454,713	331,859	370,964	702,823	448,928	5,78
11	PRATAPGARH	145,598	436,794	436,794	436,794	356,821	304,667	661,488	422,525	14,26
12	ALLAHABAD	212,020	636,060	636,060	636,060	678,722	472,671	1,151,393	735,452	(99,39)
13	KAUSHABHI	65,898	197,694	197,694	197,694	151,861	168,915	320,776	204,896	(7,20)
14	JAUNPUR	197,168	591,504	591,504	591,504	479,812	401,121	880,933	562,696	28,80
15	GAZIPUR	168,327	504,981	504,981	504,981	352,864	345,882	698,746	446,324	58,65
16	VARANASHI	69,339	208,017	208,017	208,017	175,991	143,589	319,580	204,132	3,88
17	CHANDOUL	101,226	303,678	303,678	303,678	173,580	156,042	329,622	210,546	93,13
18	BAHRAICH	155,936	467,808	467,808	467,808	471,634	296,972	768,606	490,947	(23,13)
19	GONDA	145,333	435,999	435,999	435,999	462,149	348,626	810,775	517,883	(81,88)

ČČ	SRAVASTI	59,482	178,446	178,446	178,446	233,023	109,843	342,866	219,006	(40,560)
21	BALRAMPUR	82,540	247,620	247,620	247,620	298,256	143,246	441,502	282,009	(34,385)
22	MAHARAJGANJ	148,382	445,146	445,146	445,146	177,064	159,887	336,951	215,227	229,91
23	GORAKHPUR	186,018	558,054	558,054	558,054	276,632	196,132	472,764	301,978	256,07
24	DEVERIA	146,105	438,315	438,315	438,315	176,138	169,266	345,404	220,627	217,68
25	KUSHINAGAR	112,391	337,173	337,173	337,173	151,237	198,312	349,549	223,274	113,89
26	SIDDARTHNAGAR	173,043	519,129	519,129	519,129	301,066	156,953	458,019	292,560	226,56
27	BASTI	112,893	338,679	338,679	338,679	186,262	206,100	392,362	250,621	88,05
28	SANKABIT NAGAR	90,429	271,287	271,287	271,287	142,704	110,627	253,331	161,815	109,47
29	BARABANKI	166,696	500,088	500,088	500,088	401,772	319,916	721,688	460,978	39,11
0	FAIZABAD	83,594	250,782	250,782	250,782	392,940	267,642	660,582	çççççç	çççççç
CC	SULTANPUR	168,112	504,336	504,336	504,336	565,228	337,839	903,067	576,834	(72,495)
32	AMBEDKAR NAGAR	117,190	351,570	351,570	351,570	234,756	231,459	466,215	297,795	53,77
	Ch Cl [	4718946	14156838	14156838	14156838	10946140	8458826	19,404,966	12,394,922	çççççç

Year wise Production and Changes in Wheat Production in India

Market Year	Production	Unit of Measure	change
1960	10320	(1000 MT)	NA
1961	10995	(1000 MT)	6.54 %
1962	12076	(1000 MT)	9.83 %
1963	10779	(1000 MT)	-10.74 %
1964	9854	(1000 MT)	-8.58 %
1965	12258	(1000 MT)	24.40 %
1966	10394	(1000 MT)	-15.21 %
1967	11393	(1000 MT)	9.61 %
1968	16540	(1000 MT)	45.18 %
1969	18651	(1000 MT)	12.76 %
1970	20093	(1000 MT)	7.73 %
1971	23832	(1000 MT)	18.61 %
1972	26410	(1000 MT)	10.82 %
1973	24735	(1000 MT)	-6.34 %
1974	21778	(1000 MT)	-11.95 %
1975	24104	(1000 MT)	10.68 %
1976	28846	(1000 MT)	19.67 %
1977	29010	(1000 MT)	0.57 %

1978	31749	(1000 MT)	9.44 %
1979	35508	(1000 MT)	11.84 %
1980	31830	(1000 MT)	-10.36 %
1981	36313	(1000 MT)	14.08 %
1982	37452	(1000 MT)	3.14 %
1983	42794	(1000 MT)	14.26 %
1984	45476	(1000 MT)	6.27 %
1985	44069	(1000 MT)	-3.09 %
1986	47052	(1000 MT)	6.77 %
1987	44323	(1000 MT)	-5.80 %
1988	46169	(1000 MT)	4.16 %
1989	54110	(1000 MT)	17.20 %
1990	49850	(1000 MT)	-7.87 %
1991	55134	(1000 MT)	10.60 %
1992	55690	(1000 MT)	1.01 %
1993	57210	(1000 MT)	2.73 %
1994	59840	(1000 MT)	4.60 %
1995	65470	(1000 MT)	9.41 %
1996	62097	(1000 MT)	-5.15 %
1997	69350	(1000 MT)	11.68 %

1998	66350	(1000 MT)	-4.33 %
1999	70780	(1000 MT)	6.68 %
2000	76369	(1000 MT)	7.90 %
2001	69680	(1000 MT)	-8.76 %
2002	71810	(1000 MT)	3.06 %
2003	65100	(1000 MT)	-9.34 %
2004	72150	(1000 MT)	10.83 %
2005	68640	(1000 MT)	-4.86 %
2006	69350	(1000 MT)	1.03 %
2007	75810	(1000 MT)	9.32 %
2008	78570	(1000 MT)	3.64 %
2009	80680	(1000 MT)	2.69 %
2010	80710	(1000 MT)	0.04 %

#### 1. Manual (Traditional)



#### 2. Combine Harvester



#### Experiments

Our research team visited the manufacturers of Combined Harvesters in Punjab. They visited Nabha, Distt. Patiala where they met M/s Kartar, M/s. Preet and M/s. Hindustan where our team enquired about such harvester which does cutting and thrashing together to which M/s. Preet replied that they have already done experiments on such machines but as the moisture is present in the standing crops, it is not possible for the harvester to do the thrashing process as the straw gets along with the cutter. The straw needs to be dried before thrashing process.

Then our team visited Ludhiana where they met some more manufacturers but could not get the solution for cutting and thrashing at the same time.

Then they surveyed the areas of eastern UP where they found that Combined Harvesters come from Punjab and do the Harvesting Process.

They interacted with the combine manufacturers, combine operators, Farmers and the farm labors where they found various observations as mentioned in the discussion part.

Our team visited the areas of Ambedkar nagar, Barabanki, etc. to study the pattern followed in wheat harvesting. They visited Barabanki where they interacted with M/s. Govind which is a leading manufacturer of Harvesters and thrashers in Uttar Pradesh to enquire about the possibility of harvester with cutter. But there also they could not find the machine which cuts and harvests at the same time.

They visited Ambedkar Nagar district to meet the combine harvester operator in Chinvi village where they found that the big farmers give contract to the combine operators for their whole farm and in addition give some bonus per acre per day to speed up the process.

Our team visited various villages and blocks to give the demonstration of Brush Cutter in the month of April and May, 2011 which includes Kedar Nagar block & Tanda Block in Ambedkar Nagar district, Vikramjyot Block & Basti Sadar Block in Basti district, Nawab ganj Block, Tarun Block, Bikapur Block, Maya Bazaar Block, Sohawal Block, Mehboobganj Block & Poora Bazaar Block in Faizabad district.

#### Results

After study and interaction with the Manufacturers, operators and customers of machines, we got the following results machine wise

### 3. Reaper Binder



### 4. Brush Cutter



regarding Costing, Basis and Cost per acre of harvesting:

#### Discussion

Our team got various expected and various unexpected observations during their survey. After their

interaction with the Machine manufacturers, operators, farmers and farm labors, they got various observations. We have pointed our observations technique wise as below:

#### 1. Manual (Traditional) Advantages:

1. Wastage is lowest in the system.
2. Labor can cut even the fallen crop.

#### Difficulties:

1. Non availability of labour.
2. Delay in search of labour may result in loss of crop by rains.
3. Cloud in the sky increase the labour rates.
4. Time consuming process. Usually 8 man cut in 2 days.

#### 2. Combine Harvester Advantages:

1. Lowest time consuming process. Usually cut 1 acre in 30 minutes to 1 Hr.
2. Lowest man power required.

#### 1. Mannual (Traditional)

Cost	Basis	Rs. per acre	Cost	Basis	Rs. per acre
Cutting Cost	16 man @ Rs.100	1,600	Cutting and trashing cost	Rs1400 per acre	1,400
Trashing Cost	Rs1000 per acre	1,000	Straw Reaper	Rs1300 per acre	1,300
Additional Man Power	8 man @ Rs. 60 per Hr X 1.5 Hrs	720	Loss of Crop	100 Kg @ 10,000 PMT	1,000
<b>Total Cost</b>		<b>3,320</b>	<b>Total Cost</b>		<b>3,700</b>
<b>Return</b>			<b>Return</b>		
Wheat	1.5 Mt	15,000	Wheat	1.5 Mt	15,000
Wheat Straw	1.75 Mt @ Rs. 1500 PMT	2,625	Wheat Straw	1.75 Mt @ Rs. 1500 PMT	2,625
<b>Total Income</b>		<b>17,265</b>	<b>Total Income</b>		<b>17,265</b>
<b>Net Earning</b>		<b>13,945</b>	<b>Net Earning</b>		<b>13,565</b>

#### Disadvantages:

1. Wastage is high in the system.
2. Combined Harvesting charges are high.
3. Farmers do not use straw and burn their field after cutting crop. Thus lot of carbon emission and loss of wheat straw.
4. Combine Harvester leave around 200 Kg of the crop in the field.
5. Very Costly machine.

#### 3. Reaper Binder

#### Advantages:

1. Less Time consuming process. Usually cut 1 acre in 1 hour.
2. Lower man power require.

#### Disadvantages:

1. Cutting and binding charges are high.
2. Costly machine.
3. Man power still required for trashing.
4. Down time of machine is high.

#### 4. Brush Cutter

#### Advantages:

1. Wastage is lowest in the system.
2. Lowest Cost.
3. Good for small farmers.
4. Good for labours who cut the field.
5. Cheapest Machine.

#### Disadvantages:

1. Non availability of labour.
2. Less Time consuming process. Usually 1 man can cut 1 acre in day.

#### Conclusion

After discussion, we came to the following conclusions:

### 3. Reaper Binder

Cost	Basis	Rs. per acre	Cost	Basis	Rs. per acre
Cutting and binding cost	Rs1800 per acre	1,800	Cutting Cost	2.5 Ltr @Rs.62 +engine Oil	200
Trashing Cost	Rs1000 per acre	1,000	Trashing Cost	Rs1000 per acre	1,000
Loss of Crop	100 Kg @ 10,000 PMT	1,000	Additional Man Power	8 man @ Rs. 60 per Hr X 1.5 Hrs	720
<b>Total Cost</b>		<b>3,800</b>	<b>Total Cost</b>		<b>1,920</b>
<b>Return</b>			<b>Return</b>		
Wheat	1.5 Mt	15,000	Wheat	1.5 Mt	15,000
Wheat Straw	1..75 Mt @ Rs. 1500 PMT	2,625	Wheat Straw	1..75 Mt @ Rs. 1500 PMT	2,625
<b>Total Income</b>		<b>17,265</b>	<b>Total Income</b>		<b>17,265</b>
<b>Net Earning</b>		<b>13,465</b>	<b>Net Earning</b>		<b>15,345</b>

1. In most of the areas people still use the traditional methods of wheat harvesting as it is the cheapest and farmers can get full grains along with full straw. But the problem comes when labour demand high wages as they are already getting job and high wages through NREGA schemes and at the time of harvesting, their demand is high. So, they demand high and also their availability is low which may result in standing crop damage due to unexpected rain. Sometimes when the crop is not harvested in the right time, insects or rodents may damage the crops. So, most of the farmers are shifting to mechanical methods of harvesting to save time and money. But these mechanical methods do not care for the by products like wheat straw. They concentrate only on the grains.
2. People in UP and other states prefer Combined Harvesters as the labour cost is increasing day by day pertaining to NREGA schemes. Also Combined Harvesters save a lot of time. It prevents the standing crop from getting damaged due to unexpected rains as it cuts the crop in very less time. Farmer has to sacrifice the straw but it gets compensated by full grain. While using combined harvesters, the harvester only concentrates on the grains and the straw remains in the field. There are two options now for the farmers, first to get the straw by using another reaper or burn the field. In the first option, farmer has to get another straw reaper. He has to attach tractor to

the straw reaper with a trolley at the back. It is like a small train. Small farmers cannot use it as it gets complicated while turning in small farms. So they usually burn the fields. Medium farmers usually use it to procure straw part. Large farmers also do not use it as they are only concerned with the grains. They say that the income from straw will be compensated by the expenses on the additional straw reaper.

In the second option, where farmers burn their fields, the straw burns and farmer gets carbon in their fields which acts like fertilizer. Some times the farmer does not burn it. He just ploughs the field and fills water in it before putting paddy in the field. The straw perishes and becomes natural fertilizer.

3. Farmers generally avoid using reaper binder machine. As it is very costly, skilled manpower is required which charges high and machine can run only for 10 hours a day which means 10 acres per day. The harvesting season generally lasts for 20-25 days and this machine can cut only 250-300 acres in that period to a maximum. So, farmers generally prefer combined harvesters which are easily available on hire from Punjab. If they have to use reaper binder, either they have to purchase it, or if they hire it, they have to pay more per acre as compared to combined harvesters. The advantage with reaper binder is, the farmer gets full grains along

with the straw which he can sell and get the proceeds.

4. The new technique is the Brush Cutter where farmer or a labour cuts the crop. In this technique, the grain as well as the straw is recovered. This technique is less complicated as the farmer can himself cut the farm. This is the best technique for small and medium farmers. The main problem is that, this technique requires a lot of energy. An operator can hardly operate for 30-40 minutes at a stretch and then he need a rest of 15-20 minutes as the machine is supported on the operator's shoulders and vibrates a lot along with requirement of lot of pressure to cut and collect the crops. It is best when used by 2-3 operators at the same time in a sequence where one operator operates then he rests for 30 minutes till another operator operates for that time. The main advantage with this machine is that it cuts the straw from the bottom and wasting negligible amount of straw.

### References

1. UN Food & Agriculture Organization (FAO)
2. United Nation Department of Agriculture
3. Dept. Of E & S, Govt. of India, Krishi Bhawan, New Delhi
4. Interactions with Machine Manufactureres, Operators, Farmers and Farm Labourers.